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O.W.R.C.
Water Pollution
Survey

THE
ONTARIO WATER RESOURCES
COMMISSION



WATER POLLUTION SURVEY

of the

VILLAGE OF MADOC

1969

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THE
ONTARIO WATER RESOURCES
COMMISSION
Report on a
Water Pollution Survey
of the
V I L L A G E O F M A D O C
DIVISION OF SANITARY ENGINEERING
DISTRICT ENGINEERS BRANCH
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WATER POLLUTION SURVEY

of the

VILLAGE OF MADOC

INTRODUCTION

A water pollution survey was made of the Village of Madoc by Commission staff on July 27, 1967, and July 10, 1968, to review the local conditions of Deer Creek. An initial survey of the surface water quality was made in 1960, as part of an overall survey of the Moira River System. A subsequent water quality survey was made of Deer Creek in July 24, 1964.

This type of survey is intended to locate potential and existing sources of pollution which could adversely effect the water quality. If the results of the survey indicate a pollution problem, corrective action is recommended to those parties concerned.

Samples were collected from various outfalls and at pertinent locations along the river. The sampling programme was extended into the adjoining townships in 1968. The Water Quality Surveys Branch of the Commission maintains a monitoring station, with the co-operation of the Moira River Conservation Authority, on Deer Creek south of the village. The samples collected were submitted to the OWRC Laboratory in Toronto for examination and analysis.

The appendices to this report include the laboratory results, a map showing the location of the sampling points, as well as an interpretation of the analysis. A section has also been included on the need for local planning.

Assistance was obtained from Mr. T. Burnside, Reeve, Village of Madoc, J. F. King, Moira River Conservation Authority, and Messrs. L. E. Ellenton and W. Shiho, Officials of the Hastings and Prince Edward Counties Health Unit.

VILLAGE OF MADOC

General

The Village of Madoc is located at the junction of Highways #62 and #7, approximately 24 miles northwest of the City of Belleville. Madoc became an incorporated village on June 16, 1877, and presently encloses an area of 435 acres. The present population according to the 1968 municipal directory is 1312.

Surface Waters

The major drainage course through the village is Deer Creek which is part of the Moira River drainage system. In the northern section of the village the two branches of Deer Creek join and flow in a southerly direction through the village and empty into Moira Lake.

Water Supply

The Village of Madoc is served by a municipal water works system. The water supply is obtained from a 160 foot deep well which was originally drilled in 1955.

Chlorination is the only treatment provided at this water works and it is being used solely as a means of disinfection. The bacterial quality of the raw water has on occasions been unsatisfactory. The chemical quality of the water has been generally satisfactory.

Sewage Disposal

The Village of Madoc is presently served by a sewage treatment plant which provides primary treatment. The efficiency of operation at this plant is low. The samples collected during the survey reflect the deleterious effect the effluent from this plant was having on Deer Creek.

At the present time the Village of Madoc is engaged in the development of a sewage works programme. Present plans foresee a two celled aerobic waste stabilization system which will have seasonal discharge to protect the water quality of Deer Creek. A site for the new plant is being considered in the area south of the present sewage treatment plant.

There are no major industries in the Village of Madoc. The local merchants and the small businesses serve the surrounding agricultural area.

SAMPLE RESULTS

Bacterial and chemical samples were collected on July 24, 1967, and July 10, 1968, and were submitted to the OWRC Laboratory for analysis and examination. The results have been included in the appendix. The results of the sampling programme during the 1964 Water Quality Survey have been included as a comparison of the present water quality.

The water quality of Deer Creek as indicated by the samples collected, was generally satisfactory, with the exception of the area affected by the sewage treatment plant effluent. Adverse bacterial samples were also obtained at sampling points MD-48.9 and MD-48.5 which lie in a farmland and forested area. The results reflect the effect of runoff from the surrounding farmland.

The presence of phenols was detected in a number of samples collected within the village. It was noted that the streets in the village had recently received a coat of a petroleum based product as a dust control measure. It was apparent from visual evidence that some of the material used to coat the streets had gained access to Deer Creek.

SUMMARY & CONCLUSION

A water pollution survey was made in the Village of Madoc during July 1967, and July 1968. The results of the survey indicate that the water quality of Deer Creek was generally satisfactory with the exception of that area affected by the sewage treatment plant effluent.

The Village of Madoc is presently giving consideration to the development of a sewage works programme which should improve the quality of the effluent being discharged and which should provide a greater measure of protection to the water quality of Deer Creek.

The presence of phenolic wastes detected by the samples collected is attributed to the run-off from a road spraying operation. Better supervision by the municipality is required to ensure that the water quality of Deer Creek is not impaired by future spraying of the village streets.

RECOMMENDATIONS

1) The Village of Madoc should continue its efforts to develop improved sewage treatment facilities.

2) Greater supervision is required by the municipal authorities concerned with the dust control measures in order to protect the water quality of the local drainage courses.

/jkc

Prepared by:


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COMMUNITY PLANNING

The need for effective planning has become more important today than ever before. Municipalities are being burdened with the rising costs of land and labour. Therefore, any project a community hopes to develop should be based on sound planning. Planning at all levels of government is essential but, community planning can be most effective if interest and initiative is generated at the local level. The enormous benefits accrued as a result of good planning can more than compensate for the initial investment.

Community planning can be described as an effort to control and direct development effectively. This can best be achieved through the development of an official plan. An official plan is the stated intention of the local authorities with respect to orderly development within the planning area, that is prepared and set forth with professional assistance and meets the requirements as set out by the Provincial Planning Act. An official plan can be a joint effort by a number of municipalities which have common basic characteristics and common problems, or one municipality can establish a plan on its own initiative.

Orderly development yields future economy in services. Development in the community can be retarded where an official plan does not exist. A plan provides, among other things, the

framework for the rational design of water and sewage works and also the extensions of mains and collector sewer systems.

A local council having decided to proceed with a program of community planning should contact the Ontario Department of Municipal Affairs. Through its many branches, information and guidance is provided to all interested parties.

Significance of Laboratory Analyses

Bacteriological Examination

The presence of coliforms indicates pollution from human or animal excrement, or from some non-faecal forms. The objective for surface water quality in Ontario is a maximum of 2400 organisms per 100 millilitres.

The OWRC Laboratories employ the Membrane Filter (MF) technique of examination to obtain a direct enumeration of coliform organisms. The Department of Health Laboratories use the Most Probable Number (MPN) enumeration and coliform counts are reported as Total Coliform Organisms (TC) and Faecal Coliform Organisms (FC).

Sanitary Chemical Analyses

Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is reported in parts per million (ppm) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The completion of the laboratory test required five days, under the controlled incubation temperature of 20° Centigrade.

The OWRC objective for surface water quality is an upper limit of four (4) ppm.

Solids

The value for solids, expressed in parts per million (ppm) is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally

the most significant of the solids analyses with regard to surface water quality.

The effects of suspended solids in water are reflected in difficulties associated with water purification, depositions in streams and injury to the habitat of fish. Where suspended solids values are less than 20 ppm, laboratory difficulties are experienced and the turbidity is determined instead.

Turbidity

Turbidity is caused by the presence of suspended matter, such as clay, silt, finely divided organic matter, plankton and other microscopic organisms in water. It is an expression of the optical property of a sample and the results are reported in "turbidity units".

Physical Determinations

Dissolved Oxygen

The amount of dissolved oxygen contained in unpolluted water fluctuates with the temperature. A deficiency of oxygen in the water is replaced by oxygen from the atmosphere. There is a saturation value for each temperature. At 18° C this is 9.54 ppm of dissolved oxygen. Values below the saturation level indicate the presence of polluting organic substances which are absorbing oxygen from the water. The extent of this deficiency is one index of the degree of organic pollution. Substantial reduction in

dissolved oxygen causes suffocation of fish.

Temperature

The temperature of water influences the solubility of oxygen and the rate of oxidation and purification.

Phenols

The presence of phenol or phenolic equivalents is generally associated with discharges containing petroleum products, or with wastes from some industries. It is generally conceded that adequate protection of surface waters will be provided if the concentration of phenols in waste discharged does not exceed 20 parts per billion (ppb). Phenolic type waste can cause objectionable conditions in water supplies and might taint the flesh of fish.

APPENDIX II

Nitrogen

Ammonia Nitrogen is sometimes called free ammonia and is the soluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically. Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water.

The following values may be of general significance in appraising free ammonia content: Low 0.015 to 0.03 ppm; moderate 0.03 to 0.10 ppm; high 0.10 or greater.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl less the Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Nitrite Nitrogen

Nitrite is usually an intermediate oxidation product of ammonia. The significance of nitrites, therefore, varies with their amount, source and relation to other constituents of the sample, notably the relative magnitude of ammonia and nitrate present. Since nitrite is rapidly and easily converted to nitrate, its presence in concentrations greater than a few thousands of a part per million is generally indicative of active biological processes in the water.

Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

The following ranges in concentration may be used as a guide. Low, less than 0.1 ppm; moderate 0.1 to 1.0 ppm; high, greater than 1.0 ppm.

Phosphorus

Total Phosphorus

Total Phosphorus is a measure of both the organic and inorganic forms of phosphorus present.

Soluble Phosphorus is a measure of the orthophosphate only and when subtracted from the total phosphorus gives an indication of the concentration of organic phosphorus present. That is, the soluble phosphorus in the form of polyphosphate, which, however, in surface waters is usually insignificant. Inorganic phosphorus in concentration in excess of 0.01 ppm may cause nuisance conditions.

Anionic Detergents (ABS)

The presence of anionic detergents as ABS is an indication that domestic waste is present.

Chemical Analyses

Hardness

The hardness of water reflects the nature of the geological formations with which it has been in contact. Hard waters are as satisfactory for human consumption as soft waters. Water with a hardness of 75-100 ppm are considered moderately hard and waters with a hardness of 150-300 ppm are classified as hard.

Alkalinity

The alkalinity of natural waters is caused by three major classes of materials which may be ranked in order of their effect on pH as follows: (1) hydroxides (2) carbonates and (3) bicarbonates and other salts of weak acids. The alkalinity of water has little sanitary significance but is of importance in water, sewage and industrial waste treatment practices.

Iron

The OWRC Drinking Water Objectives set a limit of 0.3 ppm for iron. This limitation is based on consideration of appearance rather than health.

Chlorides

Chlorides in reasonable concentrations are not harmful to humans. At concentrations above 250 ppm they give a salty taste to the water which is objectionable to many people. For this reason, the OWRC Drinking Water Objectives recommends that chlorides be

limited to 250 ppm in supplies intended for public use.

pH

The pH value, for practical purposes, refers to acidity or alkalinity, and is a measure of intensity rather than quality. The pH scale extends from zero (very acidic) to 14 (very alkaline), with the middle value of 7 corresponding to neutrality at 25° Centigrade. The pH of surface water should be in the range of 6.7 to 8.5.

ALL RESULTS REPORTED IN PPM EXCEPT WHERE INDICATED

WATER POLLUTION SURVEY

OF

DEER CREEK

IN THE VICINITY OF THE VILLAGE OF MADOC

<u>SAMPLING PT.</u>	<u>LOCATION</u>	<u>DATE</u>	<u>5-DAY BOD</u>	<u>S O L I D S</u>		<u>COLIFORM BACTERIA PER 100 ML</u>	<u>PHENOLS (PPB)</u>	<u>A.B.S.</u>
				<u>SUSP.</u>	<u>DISS.</u>			
MDM-48.9	EAST BRANCH OF MADOC CREEK AT COUNTY ROAD 1 1/2 MILES NORTH-EAST OF MADOC	JULY 24, 1964	1.6	1	293	570	--	--
		JULY 10, 1968	0.9	10	310	3,200	--	--
MDM-47.95	EAST BRANCH OF MADOC CREEK AT HIGHWAY No. 7	JULY 24, 1964	2.2	3	255	540	--	--
		JULY 27, 1967	0.6	4	338	160	--	--
		JULY 10, 1968	1.1	11	289	316	--	--
MD-48.8	DEER CREEK AT ROAD ALLOWANCE BETWEEN CONC. 4 & 5, MADOC TOWN- SHIP NORTH OF HIGHWAY No. 7	JULY 24, 1964	0.8	2	244	1,150	--	--
		JULY 10, 1968	0.7	22	260	368	--	--
MD-48.5	DEER CREEK AT HIGHWAY No. 7	JULY 10, 1968	0.5	10	274	2,600	--	--
MD-47.93	DEER CREEK 50 YARDS WEST OF JUNC- TION WITH MADOC CREEK NEAR HIGHWAYS No. 7 AND No. 62	JULY 24, 1964	2.0	47	265	1,070	--	--
		JULY 27, 1967	0.6	10	310	188	--	--
		JULY 10, 1968	0.8	9	285	1,900	--	0.0
MD-47.65	DEER CREEK AT THE WEST END OF QUEEN VICTORIA STREET	JULY 24, 1964	2.0	9	247	550	--	--
		JULY 27, 1967	1.0	12	302	260	--	--
		JULY 10, 1968	0.9	11	277	1,300	--	0.0
MD-47.45	DEER CREEK AT RUSSELL STREET BRIDGE	JULY 24, 1964	2.4	8	272	710	2	--
		JULY 27, 1967	0.8	8	242	490	--	--
		JULY 10, 1968	0.9	11	293	2,400	20	0.0
MD-47.45 W	STORM SEWER OUTFALL TO NORTH BANK OF DEER CREEK ON THE WEST SIDE OF RUSSELL STREET	JULY 27, 1967		INSIGNIFICANT		FLOW		
		JULY 10, 1968		INSIGNIFICANT		FLOW		

CONT.

SAMPLING PT.	LOCATION	DATE	5-DAY BOD	S O L I D S		COLIFORM BACTERIA PER 100 ML	PHENOLS (PPB)	A.B.S.
				SUSP.	DISS.			
MD-47.38	DEER CREEK JUST NORTH OF LAWRENCE STREET	JULY 27, 1967	1.2	9	257	450	--	--
MD-47.3	DEER CREEK AT LAWRENCE STREET	JULY 24, 1964	1.6	6	242	900	--	--
		JULY 27, 1967	0.5	6	266	410	--	--
		JULY 10, 1968	1.1	15	275	600	--	0.0
MD-47.3W (WS)	STORM SEWER OUTFALL TO WEST BANK OF DEER CREEK ON SOUTH SIDE OF LAWRENCE STREET BRIDGE	JULY 24, 1964	1.9	33	289	2,700	--	--
		JULY 27, 1967	1.1	10	310	200	--	--
		JULY 10, 1968	1.0	10	278	1,300	--	0.0
MD-47.3 W (EN)	STORM SEWER OUTFALL TO EAST BANK OF DEER CREEK ON NORTH SIDE OF LAWRENCE STREET BRIDGE	JULY 24, 1964	---	---	---	570	--	--
		JULY 27, 1967			N 0	F L 0 W		
		JULY 10, 1968			N 0	F L 0 W		
MD-47.3 W (ES)	STORM SEWER OUTFALL TO EAST BANK OF DEER CREEK ON SOUTH SIDE OF LAWRENCE STREET BRIDGE	JULY 24, 1964	---	---	---	60	--	--
		JULY 27, 1967			N 0	F L 0 W		
		JULY 10, 1968			N 0	F L 0 W		
MD-47.15	DEER CREEK AT LIVINGSTONE AVENUE BRIDGE	JULY 24, 1964	1.7	14	238	390	--	--
		JULY 27, 1967	1.0	5	303	148	--	--
		JULY 10, 1968	1.0	7	277	1,400	5	0.0
MD-46.91	DEER CREEK AT SEYMOUR STREET BRIDGE	JULY 27, 1967	1.6	3	281	128	--	--
		JULY 10, 1968	0.9	2	266	220	--	0.0
MD-46.71	DEER CREEK 50 YARDS UPSTREAM OF SEWAGE TREATMENT PLANT OUTFALL	JULY 24, 1964	1.7	5	257	600	--	--
		JULY 27, 1967	1.6	3	281	128	--	--
		JULY 10, 1968	0.9	2	266	200	--	0.0

CONT.

<u>SAMPLING PT.</u>	<u>LOCATION</u>	<u>DATE</u>	<u>5-DAY</u>	<u>S O L I D S</u>		<u>COLIFORM BACTERIA</u> <u>PER 100 ML</u>	<u>PHENOLS</u> <u>(PPM)</u>	<u>A.B.S.</u>
			<u>BOD</u>	<u>SUSP.</u>	<u>DISS.</u>			
MD-46.68T	VILLAGE OF MADOC SEWAGE TREATMENT PLANT OUTFALL	JULY 24, 1964	104.	103	601	8,000,000	--	--
		JULY 27, 1967	83.	44	666	16,000,000	--	--
		JULY 10, 1968	31.	35	759	3,400,000	--	5.4
MD-46.65	DEER CREEK APPROXIMATELY 50 YARDS DOWNSTREAM OF SEWAGE TREATMENT PLANT OUTFALL	JULY 24, 1964	13.	20	340	340	--	--
		JULY 27, 1967	3.3	4	328	290,000	--	--
		JULY 10, 1968	2.0	4	278	36,000	--	0.1
MD-46.62	DEER CREEK APPROXIMATELY 100 YARDS BELOW SEWAGE TREATMENT PLANT OUTFALL	JULY 24, 1964	---	--	--	710,000	8	--
		JULY 27, 1967	3.1	1	293	148,000	--	--
		JULY 10, 1968	1.8	5	271	30,000	6	0.1
MD-46.3	DEER CREEK OPPOSITE MUNICIPAL DUMP	JULY 10, 1968	1.8	16	290	1,300	--	0.1
MD-45.3	DEER CREEK NEAR MOIRA LAKE	JULY 10, 1968	1.2	5	291	1,500	--	0.1

WATER QUALITY MONITORING PROGRAMME

PERIOD - OCTOBER 1966 - SEPTEMBER 1968

WATERSHED MOIRA RIVER

STREAM DEER CREEK

SAMPLING POINT NUMBER MD-46.5

LOCATION 100 YARDS DOWNSTREAM FROM MADOC S.T.P.

DATE	MF COLIFORMS PER 100 ML	5-DAY BOD	S O L I D S		TURB. UNITS	PHOSPHORUS		N I T R O G E N A S N				CHLORIDE AS CL.	HARDNESS AS CaCO ₃	ALKALINITY AS CaCO ₃	IRON AS FE PH		DISS- OLVED OXYGEN	WATER TEMP. ° C.
			TOTAL	SUSP.		TOTAL	SOL.	FREE AMMONIA	TOTAL KJEL.	NITRITE	NITRATE							
OCT. 3/66	-----	29	428	52	4.0	3.16	2.86	4.60	8.25	0.01	0.02	39	---	---	-----	---	7.0	10.5
NOV. 8/66	890,000	5.2	352	16	13.0	-----	0.60	0.53	1.00	-----	0.00	20	---	---	-----	---	11.0	6.0
DEC. 16/66	-----	----	---	--	---	-----	----	-----	-----	-----	-----	--	---	---	-----	---	13.0	0.0
JAN. 17/67	184	1.5	366	10	---	0.02	0.02	0.30	0.58	0.01	0.70	--	---	---	-----	---	10.0	0.0
JAN 31/67	62,000	1.5	328	<15	3.6	0.00	0.00	0.50	0.39	0.00	0.34	9	220	183	-----	---	12.0	0.0
MAR. 14/67	4,100	2.4	270	6	3.8	0.14	0.00	0.20	0.91	0.00	0.25	10	234	194	0.42	8.0	13.0	0.0
APR. 4/67	21,000	1.5	200	13	4.5	0.02	0.02	0.36	0.46	0.01	0.50	5	156	131	0.15	7.9	12.0	2.5
MAY 9/67	420	3.5	250	<15	5.0	-----	0.04	0.18	0.58	0.00	0.20	6	---	---	-----	---	8.0	12.0
JUNE 7/67	160	2.6	254	5	2.6	0.07	0.04	0.10	0.71	0.01	6.8	5	---	---	-----	---	5.0	18.0
JULY 4/67	270	0.6	286	9	6.5	0.39	0.20	0.10	0.65	0.01	0.88	7	238	229	0.62	8.2	7.0	17.5
AUG. 2/67	1,000	2.4	330	45	40.	0.28	0.05	0.23	1.68	0.00	0.07	9	236	218	3.00	8.1	5.0	20.5
SEPT. 5/67	3,800	2.0	338	20	8.5	0.08	0.02	0.10	0.33	0.01	0.06	9	224	192	0.80	8.2	----	----

PERIOD - OCTOBER 1966 - SEPTEMBER 1968

STREAM DEER CREEK

LOCATION 100 YARDS DOWNSTREAM FROM THE VILLAGE OF MADOC STP OUTFALL

DATE	MF	5-DAY BOD	S O L I D S		TURB. UNITS	PHOSPHERUS		N I T R O G E N A S N				CHLORIDE AS CL.	HARDNESS AS CaCO ₃	ALKALINITY AS CaCO ₃	IRON AS FE	PH	DISS- OLVED OXYGEN	WATER TEMP. ° C.		
	COLIFORMS PER 100 ML		TOTAL	SUSP.		TOTAL	SOL.	FREE	TOTAL	AMMONIA	KJEL.								NITRITE	NITRATE
OCT. 2/67	1,130	0.5	294	13	10.0	0.07	0.02	0.23	1.20	.009	0.10	18	216	176	0.23	7.9	12	12		
NOV. 1/67	990	1.1	268	4	11.5	0.04	0.01	0.08	0.58	.011	1.50	7	230	198	0.30	8.2	12	7		
DEC. 5/67	216	0.4	296	<15	3.5	0.05	0.04	0.12	0.39	.004	0.40	6	248	221	0.27	8.6	9	0		
JAN. 3/68	72	0.4	282	1	4.0	0.03	0.03	0.06	0.39	0.011	0.60	7	254	223	0.21	7.8	11	0		
FEB. 5/68	68	0.4	246	8	5.5	0.07	.02	0.16	.46	.007	0.50	7	206	---	0.41	7.9	12	0		
MAR. 5/68	-----	0.7	302	12	---	0.06	0.02	0.08	0.64	.009	0.20	7	258	245	0.54	8.1	10	0.0		
APR. 2/68	-----	1.4	234	19	---	--	0.02	0.16	0.46	.004	0.10	5	---	---	----	---	--	--		
MAY /68	-----	1.8	306	<15	6.0	0.18	0.02	0.11	1.03	.006	.194	7	234	216	0.38	8.3	--	--		
JUNE 4/68	-----	2.1	304	9	4.0	0.15	0.07	0.10	0.96	0.15	.142	9	236	217	0.54	7.4	--	--		
JULY 3/68	-----	7.0	258	114	9.5	0.10	0.04	0.05	1.10	0.008	.004	8	230	216	0.70	8.1	--	--		
AUG. 7/68	1,900	---	---	---	---	-----	-----	-----	-----	-----	---	--	---	---	-----	---	--	--		



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